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(45) **Date of Patent:** May 31, 2016

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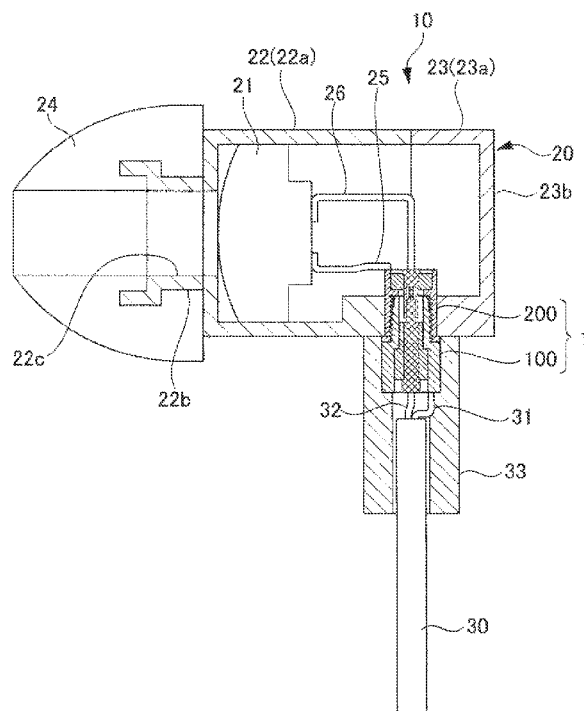
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(57) **ABSTRACT**

A receiver is provided with a connector including: an outer earbud contact composed of a tube-shaped conductor and provided on the earbud side, an inner earbud contact arranged inside the outer earbud contact via an earbud-side insulator, an outer cable contact composed of a tube-shaped conductor and provided on the cable side, and an inner cable contact arranged inside the outer cable contact via a cable-side insulator; a coaxial connector being formed when the outer contacts are screwed into each other.

**8 Claims, 12 Drawing Sheets**

(58) **Field of Classification Search**  
None  
See application file for complete search history.



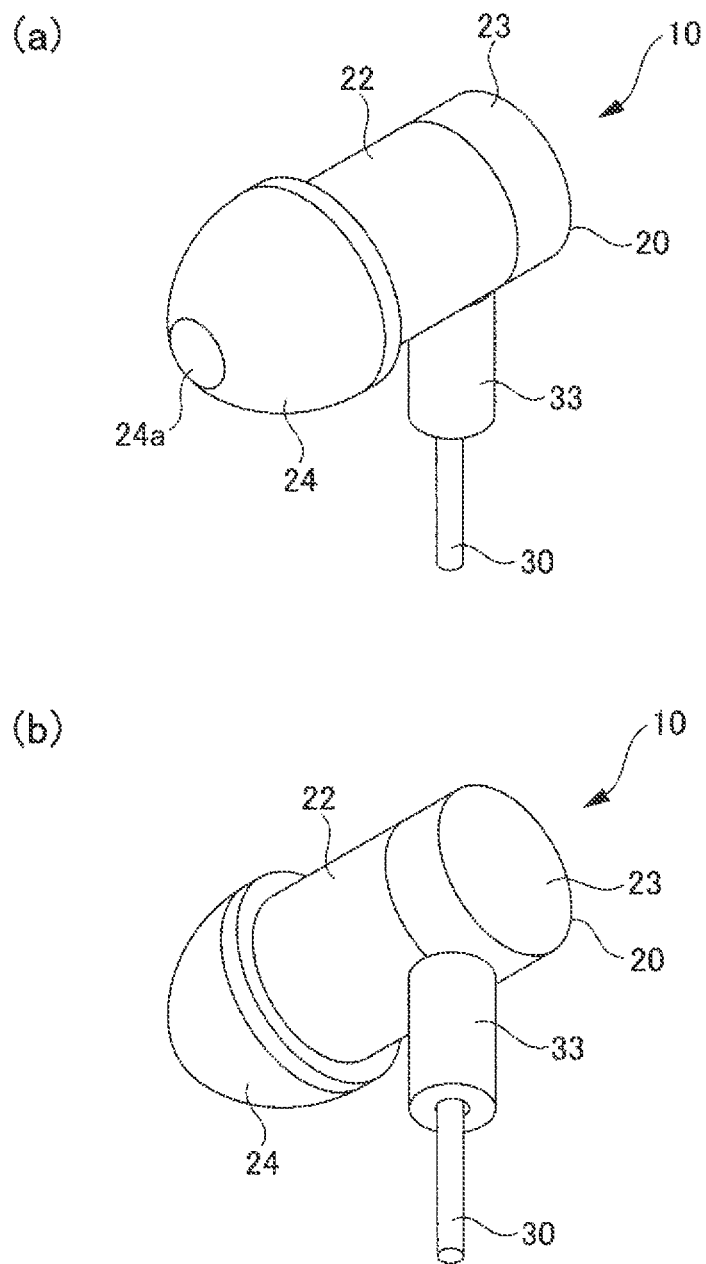


FIG. 1

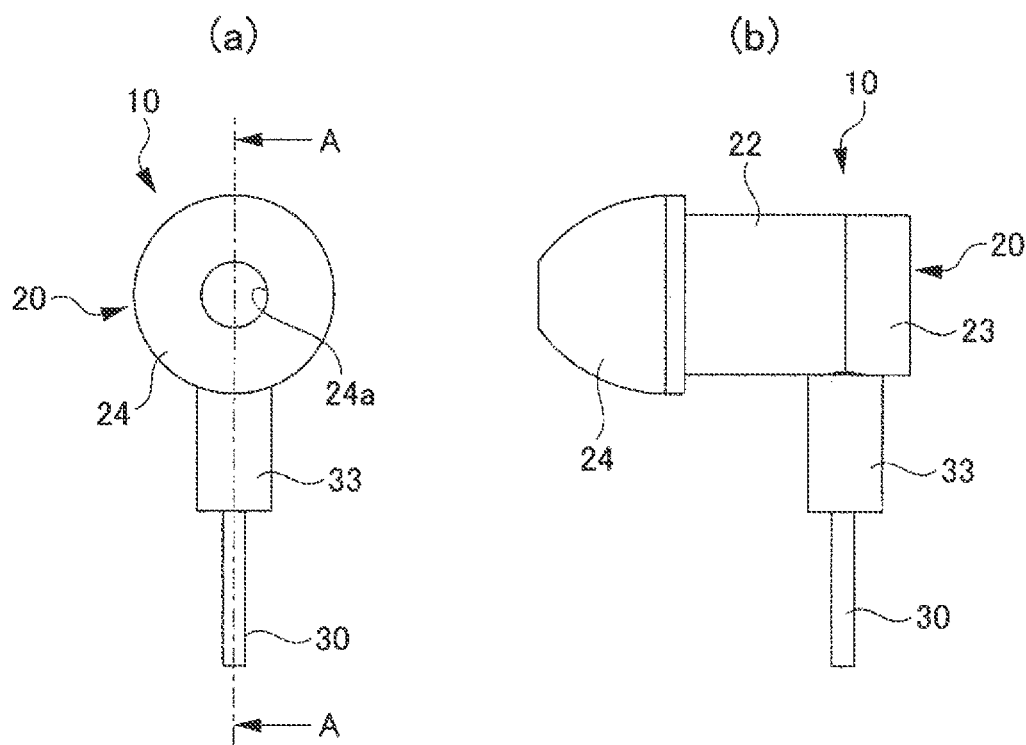


FIG. 2

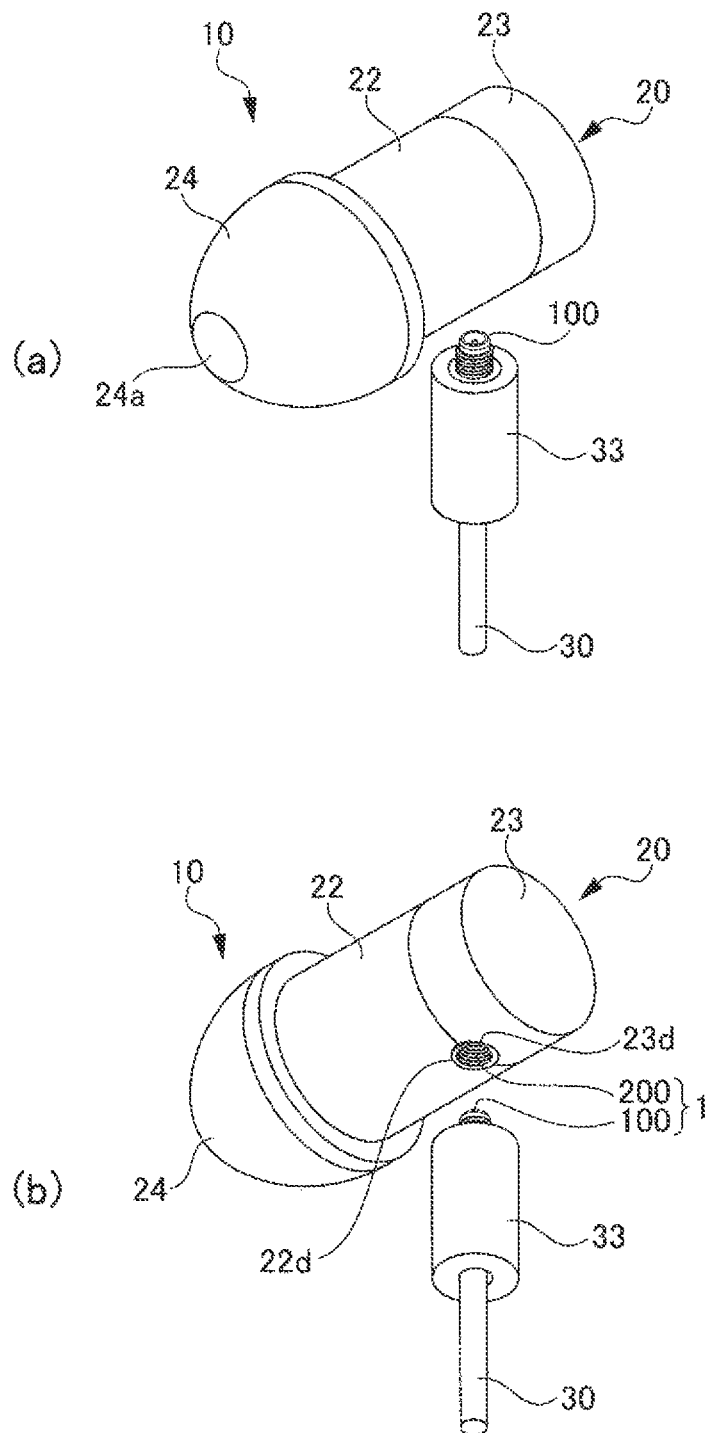


FIG. 3

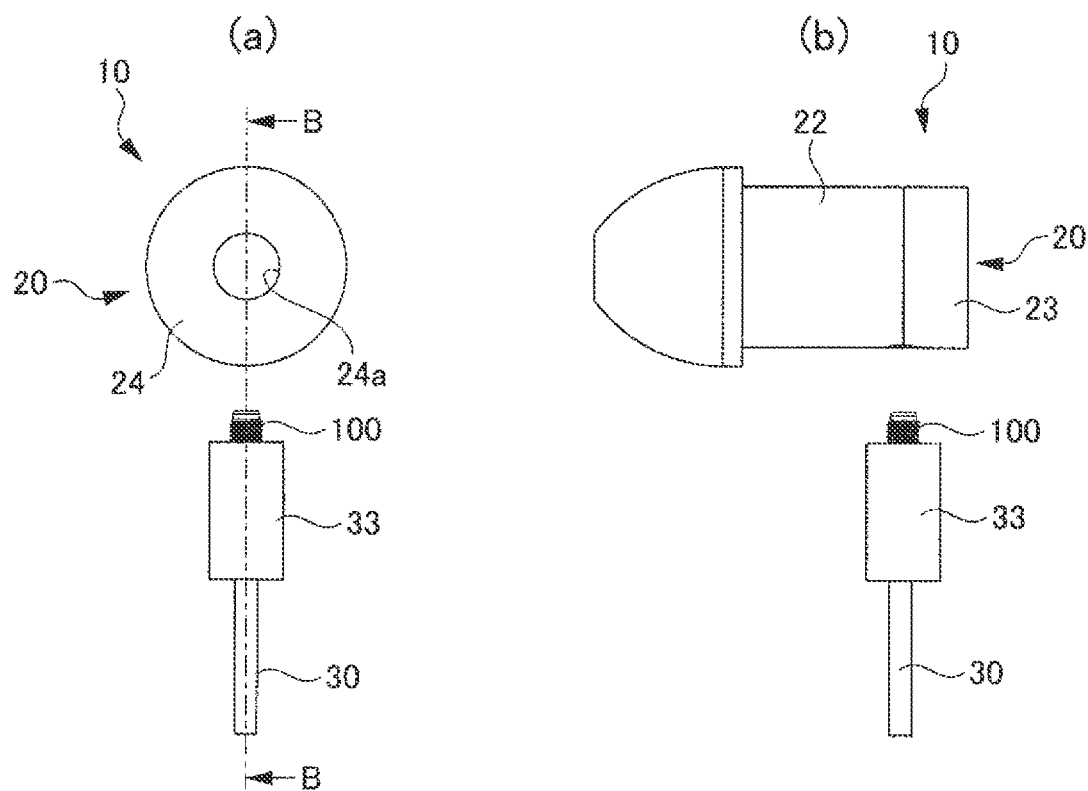


FIG. 4

FIG. 5

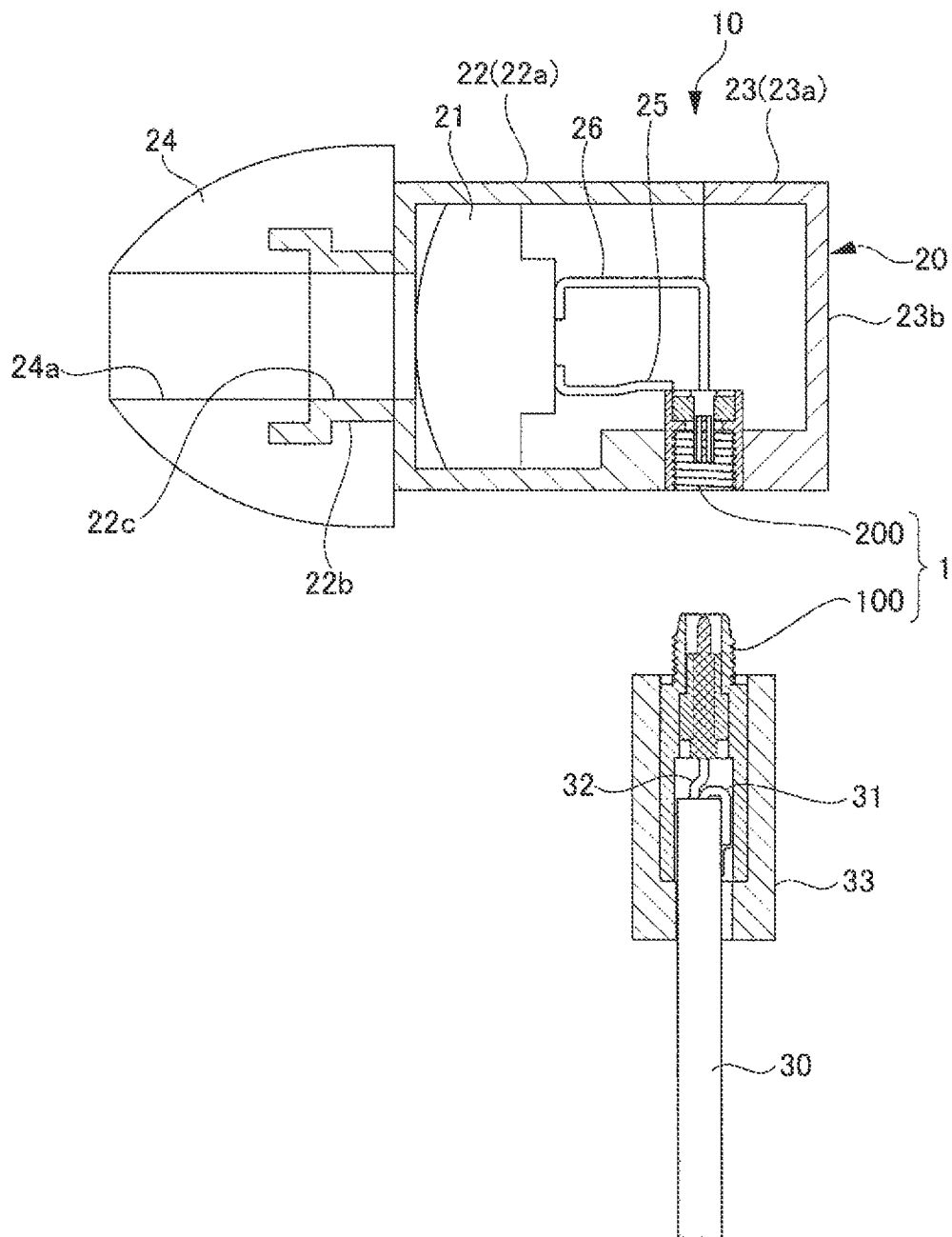


FIG. 6

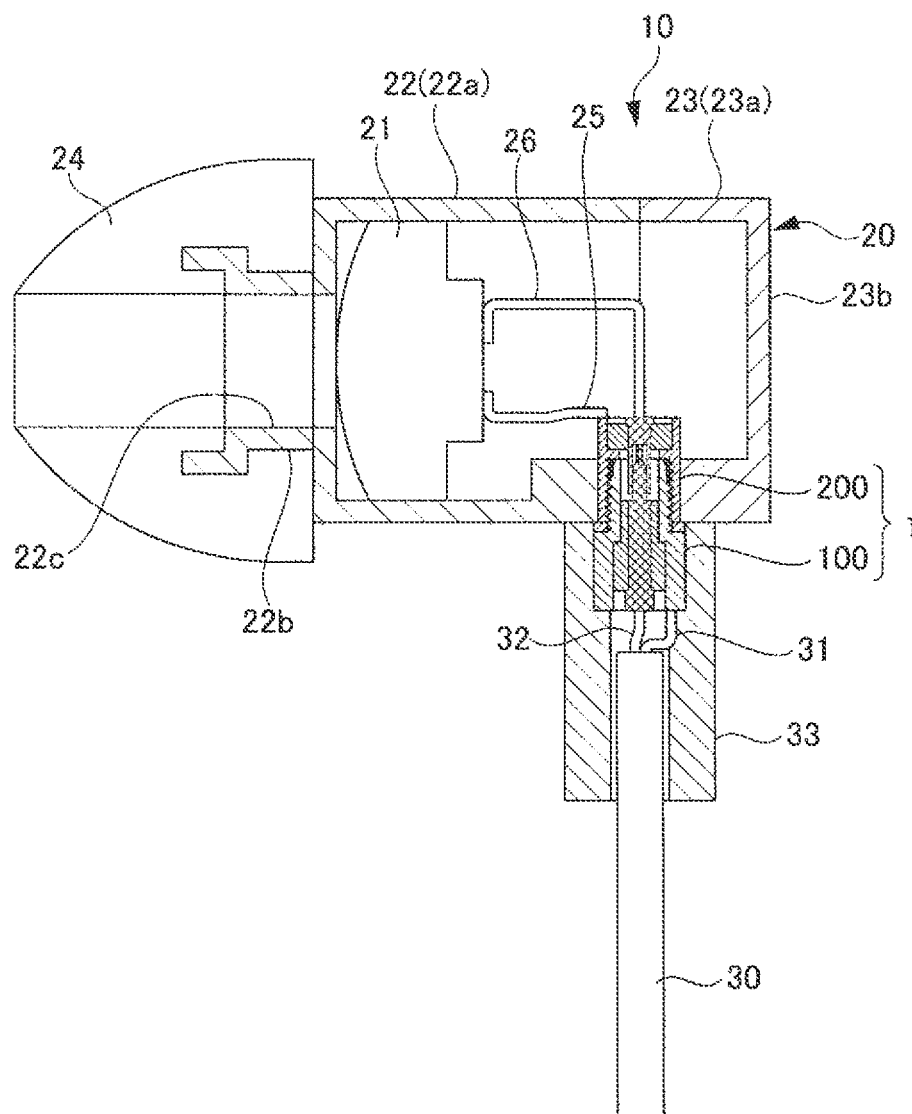


FIG. 7



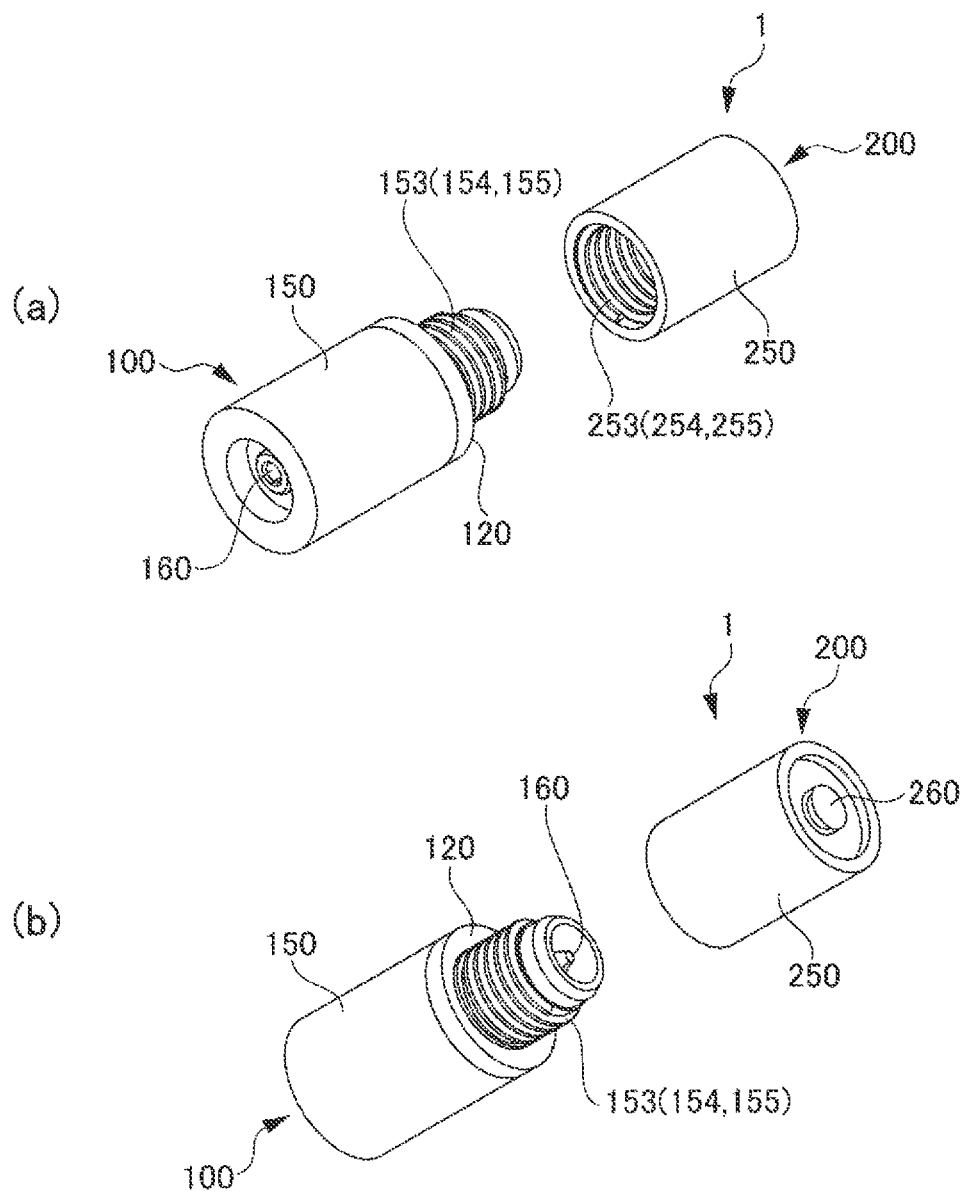


FIG. 8

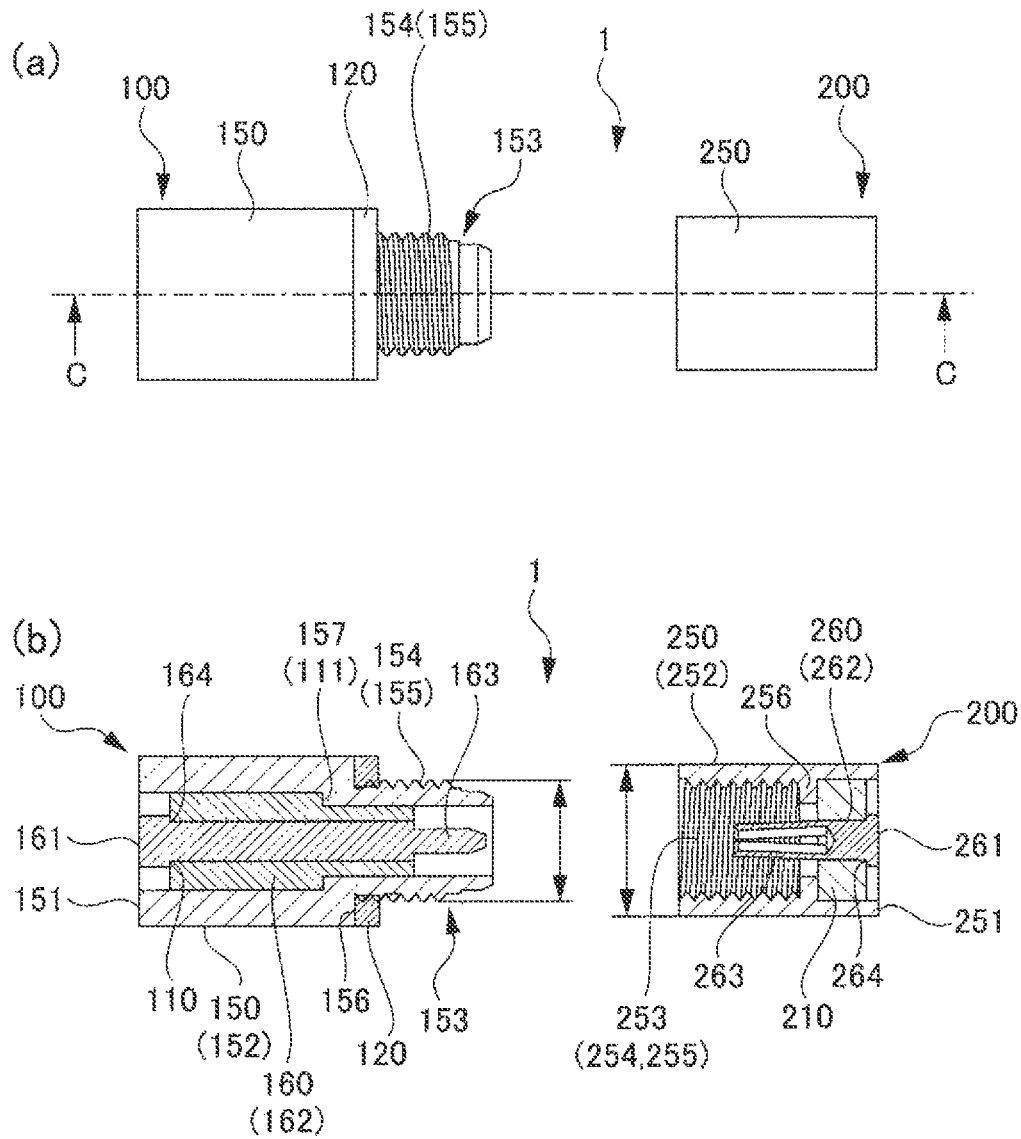


FIG. 9

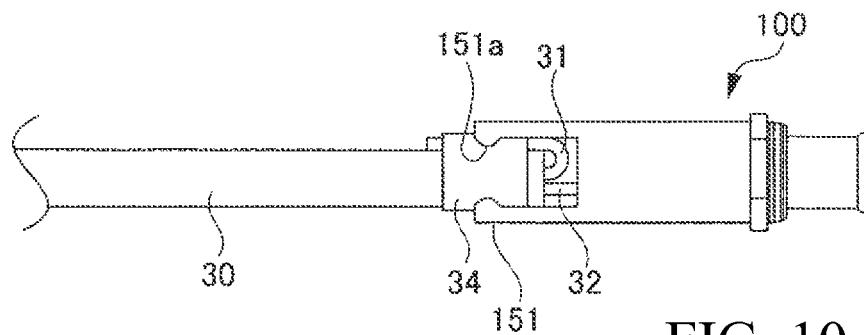


FIG. 10

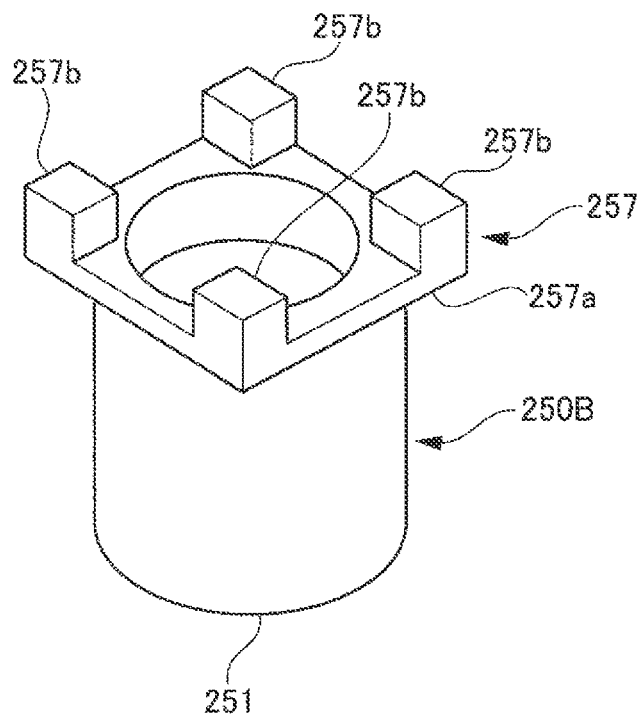


FIG. 11

FIG. 13

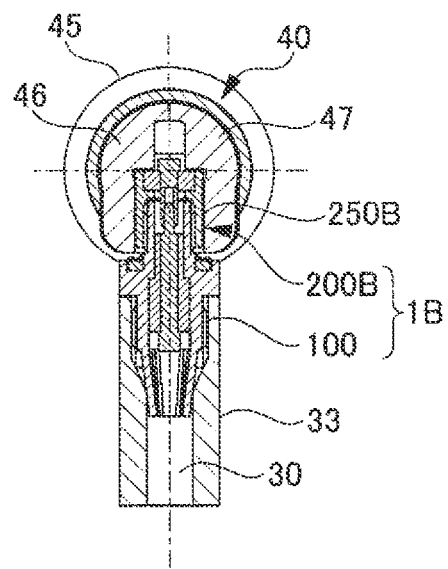


FIG. 14

## RECEIVER

## REFERENCE TO RELATED APPLICATIONS

The Present Disclosure claims priority to prior-filed Japanese Patent Application No. 2013-212450, entitled "Receiver," filed on 10 Oct. 2013 with the Japanese Intellectual Property Office. The content of the aforementioned Patent Application is incorporated in its entirety herein.

## BACKGROUND OF THE PRESENT DISCLOSURE

The Present Disclosure relates, generally, to a receiver using a connector connected to a cable and to the main body of a receiver such as an earphone or headphones, and, more particularly, to a receiver having a connector connected electrically to an earbud and to a cable, which prevents unintentional disconnection, realizes a robust connection between contacts, and prevents momentary power interruptions during use without requiring a separate retaining portion.

In a conventional receiver such as an earphone or headphones, an earbud housing a driver unit is integrally connected to a cable. As a result, both the earbud and the cable have to be replaced when a problem such as disconnection occurs in the cable. This increases the cost burden of the user.

An earphone has been proposed, for example, in Japanese Patent Application No. 2010-102516, the content of which is hereby incorporated herein in its entirety, with a detachable and replaceable cable. This cable is connected to the earbud via a plugin connector. However, because plugin connectors have very little retention force, the cable easily becomes disconnected when pulled during use.

In the earphone described in the '516 Application, a retaining portion (first engagement structure) is added on both the earbud side and the cable side. When the cable is connected to the earbud, the cable engages the retaining portions on the earbud side and the cable side and is retained. However, the addition of the retaining portions causes new problems. The connecting portions are larger on the earbud side and the cable side, and the structure becomes more complicated.

## SUMMARY OF THE PRESENT DISCLOSURE

In view of this problem, it is an object of the Present Disclosure to provide a receiver having a connector connected electrically to an earbud and to a cable, which prevents unintentional disconnection, realizes a robust connection between contacts, and prevents momentary power interruptions during use without requiring a separate retaining portion.

In order to achieve this object, the Present Disclosure is a receiver having a connector connected electrically to a receiver main body and to a cable. The connector comprises an outer main body contact, an inner main body contact, an outer cable contact and an inner cable contact. The outer main body contact is composed of a tube-shaped conductor and provided on the main body side. The inner main body contact is arranged inside the outer main body contact via an insulator. The outer cable contact is composed of a tube-shaped conductor and provided on the cable side. The inner cable contact is arranged inside the outer cable contact via an insulator. The connector is mounted on the receiver main body so that, in response to the outer main body contact and outer cable contact being mated, a coaxial connector is formed electrically connecting the outer contacts and the inner con-

tacts, the outer contacts being screwed into each other, and the outer main body contact not rotating relative to the receiver main body.

The Present Disclosure is able to provide a receiver having a connector connected electrically to an earbud and to a cable, which prevents unintentional disconnection, realizes a robust connection between contacts, and prevents momentary power interruptions during use without requiring a separate retaining portion.

## BRIEF DESCRIPTION OF THE FIGURES

The organization and manner of the structure and operation of the Present Disclosure, together with further objects and advantages thereof, may best be understood by reference to the following Detailed Description, taken in connection with the accompanying Figures, wherein like reference numerals identify like elements, and in which:

FIG. 1 is a diagram showing the earphone of the receiver in a first embodiment of the Present Disclosure connected to a cable, in which FIG. 1(a) is a front perspective view of the earphone, and FIG. 1(b) is a rear perspective view of the earphone;

FIG. 2 is a diagram showing the earphone of the receiver in the first embodiment of the Present Disclosure connected to a cable, in which FIG. 2(a) is a front view of the earphone, and FIG. 2(b) is a side view of the earphone;

FIG. 3 is a diagram showing the earphone of the receiver in the first embodiment of the Present Disclosure detached from the cable, in which FIG. 3(a) is a front perspective view of the earphone, and FIG. 3(b) is a rear perspective view of the earphone;

FIG. 4 is a diagram showing the earphone of the receiver in the first embodiment of the Present Disclosure detached from the cable, in which FIG. 4(a) is a front view of the earphone, and FIG. 4(b) is a side view of the earphone;

FIG. 5 is a cross-sectional view showing the earphone of the receiver in the first embodiment of the Present Disclosure connected to a cable, taken from Line A-A using a non-soldered connector;

FIG. 6 is a cross-sectional view showing the earphone of the receiver in the first embodiment of the Present Disclosure detached from the cable, taken from Line B-B using a non-soldered connector;

FIG. 7 is a cross-sectional view showing the earphone of the receiver in the first embodiment of the Present Disclosure connected to a cable, taken from Line A-A using a soldered connector;

FIG. 8 is a diagram showing the earphone of the receiver in the first embodiment of the Present Disclosure detached from the cable; in which FIG. 8(a) is a rear perspective view showing a soldered connector, and FIG. 8(b) is a front perspective view showing a soldered connector;

FIG. 9 is a diagram showing the earphone of the receiver in the first embodiment of the Present Disclosure detached from the cable, in which FIG. 9(a) is a side view showing a soldered connector, and FIG. 9(b) is a cross-sectional view from Line C-C showing a soldered connector;

FIG. 10 is a side view showing the structure of the connection between a cable and the cable connector of the receiver in the first embodiment of the Present Disclosure (non-soldered connector);

FIG. 11 is a perspective view showing the outer connector contact of the receiver in a second embodiment of the Present Disclosure;

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FIG. 12 is a cross-sectional view from Line A-A, showing the earphone of a receiver connected to a cable using the connector in the second embodiment of the Present Disclosure;

FIG. 13 is a cross-sectional view from Line D-D, showing the earphone of a receiver connected to a cable using the connector in the second embodiment of the Present Disclosure; and

FIG. 14 is a cross-sectional view from Line E-E showing the earphone of a receiver connected to a cable using the connector in the second embodiment of the Present Disclosure.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the Present Disclosure may be susceptible to embodiment in different forms, there is shown in the Figures, and will be described herein in detail, specific embodiments, with the understanding that the Present Disclosure is to be considered an exemplification of the principles of the Present Disclosure, and is not intended to limit the Present Disclosure to that as illustrated.

As such, references to a feature or aspect are intended to describe a feature or aspect of an example of the Present Disclosure, not to imply that every embodiment thereof must have the described feature or aspect. Furthermore, it should be noted that the description illustrates a number of features. While certain features have been combined together to illustrate potential system designs, those features may also be used in other combinations not expressly disclosed. Thus, the depicted combinations are not intended to be limiting, unless otherwise noted.

In the embodiments illustrated in the Figures, representations of directions such as up, down, left, right, front and rear, used for explaining the structure and movement of the various elements of the Present Disclosure, are not absolute, but relative. These representations are appropriate when the elements are in the position shown in the Figures. If the description of the position of the elements changes, however, these representations are to be changed accordingly.

As shown in FIGS. 1-2, the earphone 10 includes an earbud 20 fitted into the user's ear, and a cable 30 connected to the earbud 20 on one end. The cable 30 is connected on the other end to an audio device such as a music player, television, or radio (not shown) via a connector (not shown), and electrical signals outputted from the audio device are inputted to the earbud 20. The earbud 20 converts the electrical signals inputted from the cable 30 into sound, and outputs the sound. As shown in FIGS. 3-4, the earbud 20 and the cable 30 are connected electrically via a connector 1. The connector 1 includes and is composed of a cable connector 100 provided on the cable 30 side, and an earbud connector 200 provided on the earbud 20 side. When the cable connector 100 and the earbud connector 200 are mated, the cable 30 is connected to the earbud 20. When the cable connector 100 and the earbud connector 200 are unmated, the cable 30 is disconnected from the earbud 20. When a problem such as disconnection occurs in the cable 30, the cable 30 is simply replaced. As shown in FIGS. 5-6, the earbud 20 includes a driver unit 21 for converting electrical signals to sound, a front casing 22 and rear casing 23 for housing the driver unit 21, and an ear pad 24 inserted into the user's ear.

The front casing 22 includes a large-diameter tube portion 22a for housing the driver unit 21, and small-diameter tube portion 22b protruding forward from the large-diameter tube portion 22a and having the ear pad 24 applied to its outer

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periphery. The tube portions are integrally formed. An acoustic guide opening 22c is formed in the front end portion of the small-diameter portion 22b. The sound generated by the driver unit 21 is outputted from this, and the outputted sound propagates inside the user's ear via an acoustic guide hole 24a in the ear pad 24.

The rear casing 23 includes a large-diameter tube portion 23a connected to the large-diameter portion 22a of the front casing 22, and a lid portion 23b covering the rear end of the large-diameter portion 23a. These components are integrally formed. Semi-circular recessed portions 22d, 23d are formed in the abutting surfaces of the front casing 22 and the rear casing 23, and the earbud connector 200 is incorporated into the round hole formed by the abutting recessed portions 22d, 23d. The earbud connector 200 is connected electrically to the driver unit 21 via a pair of conductive wires 25, 26. The earbud connector 200 and the rear casing 23 are, for example, forcibly connected and secured using an adhesive so that the earbud connector 200 does not rotate with respect to the rear casing 23. The recessed portions 22d, 23d may be rectangular instead of semi-circular, and the external shape of the earbud connector 200 may be rectangular to prevent rotation. In this way, the connector 1 can be screwed in while preventing the earbud connector 200 from rotating with respect to the rear casing 23.

As shown in FIGS. 5-6, a cable connector 100 is provided in the end portion of the cable 30. The cable connector 100 is connected electrically to a pair of conductive wires 31, 32 passing through the cable 30, and the section excluding the leading end portion is covered by a tube-shaped cover 33.

In the present embodiment, the cable connector 100 is a plug connector or male connector, and the earbud connector 200 is a receptacle connector or female connector. Alternatively, the cable connector 100 may be a receptacle connector, and the earbud connector 200 may be a plug connector.

The cable connector 100 shown in FIGS. 5-6 is a non-soldered connector that can be connected to the conductive wires 31, 32 of the cable 30 without using solder. However, the cable connector in FIG. 7 is a soldered connector which is soldered to the conductive wires 31, 32 of the cable 30.

The following is a more detailed explanation of the configuration of the connector 1 in the first embodiment of the Present Disclosure with reference to FIGS. 8-10. As shown in FIGS. 8-9, the connector 1 in the present embodiment is an ultra-small coaxial connector whose outer diameter fitted to the cable connector 100 may be 2 mm, and whose outer diameter fitted to the earbud connector 200 may be 2.5 mm.

The cable connector 100 includes an outer cable contact 150 made of a tube-shaped conductor, a tube-shaped cable-side insulator 110 arranged inside the outer cable contact 150, a pin-shaped inner cable contact 160 arranged inside the cable-side insulator 110, and a washer-shaped loose threading-preventing member 120 attached to the outer peripheral portion of the outer cable contact 150. The earbud connector 200 includes an outer earbud contact 250 made of a tube-shaped conductor, a tube-shaped earbud-side insulator 210 arranged inside the outer earbud contact 250, and a pin-shaped inner earbud contact 260 with a divided tip arranged inside the earbud-side insulator 210.

When the outer cable contact 150 and the outer earbud contact 250 are mated, the cable 100 connector and the earbud connector 200 form a coaxial connector in which the outer contacts 150, 250 and the inner contacts 160, 260 are connected electrically. The following is an explanation of each component of the cable connector 100 and the earbud connector 200. The outer cable contact 150 is made of a conductor with a cylindrical shape, and includes a connecting portion

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**151** connected to a conductive wire **31** in the cable **30**, a fixed portion **152** fixed to the cover **33**, a mating protrusion **153** mated with the outer earbud contact **250**, and a contact portion **154** making contact with the outer earbud contact **250** during mating.

The connecting portion **151** is the rear end portion of the fixed portion **152**, and the mating protrusion **153** is formed so as to protrude from the front end portion of the fixed portion **152**. The mating protrusion **153** is mated on the inside of the outer earbud contact **250**, and the outer peripheral surface forms a contact portion **154** which makes contact with the outer earbud contact **250**. Threading grooves **155** are formed on the contact portion **154** enabling the outer earbud contact **250** to be screwed in.

In the case of a non-soldered connector, as shown in FIG. **10**, a connecting protrusion **151a** is provided in the connecting portion **151** to serve as a correcting chuck for the outer cable contact **150**. When a conductive wire **31** in the cable **30** is connected to the correcting chuck-type connecting portion **151**, the conductive wire **31** is bent back towards the outer periphery of the cable **30**, and copper foil tape **34** is wound on top of this so as to be interposed by the connecting protrusion **151a** provided on the correcting chuck-type connecting portion **151**. As shown in FIG. **12**, the connecting portion **151** is forcibly pressed by an inclined portion **33a** formed in the cover **33** shown in the second embodiment to push the connecting protrusion **151a** into the copper foil tape **34**. When the cable connector **100** has a non-soldered configuration, the soldering process can be eliminated, and a damaged cable can be easily replaced.

In the outer cable contact **150** of the present embodiment, the outer diameter of the mating protrusion **153** is smaller than that of the fixed portion **152**, a tiered surface **156** is formed between the fixed portion **152** and the outer peripheral portion of the mating protrusion **153**, and a washer-shaped loose threading-preventing member **120** is attached so as to come into contact with the tiered surface **156**. There are no particular restrictions on the material from which the loose threading-preventing member **120** is made, but an elastic material that generates strong frictional force when compressed is preferred. A spring washer or washer with a chrysanthemum-shaped base having a loosening preventing effect can also be used.

The cable-side insulator **110** is made of an insulator with a cylindrical shape, and is forcibly inserted onto the rear opening of the outer cable contact **150**. Tiered surfaces **157**, **111** are formed in the inner peripheral portion of the outer cable contact **150** and in the cable-side insulator **110**. The insertion position of the cable-side insulator **110** relative to the outer cable contact **150** is defined by the abutting tiered surfaces **157**, **111**.

The inner cable contact **160** is made of a pin-shaped conductor, and includes a connecting portion **161** connected to a conductive wire **32** in the cable **30**, a fixed portion **162** fixed to the cable-side insulator **110**, and a contact portion **163** making contact with the inner earbud contact **260**. The connecting portion **161** is formed in the rear end of the fixed portion **162**, and the contact portion **163** is formed so as to protrude from the front end of the fixed portion **162**.

The inner cable contact **160** is forcibly inserted from the rear opening of the cable-side insulator **110**. A tiered surface **164** is formed in the rear end of the inner cable contact **160**, and the insertion position of the inner cable contact **160** relative to the cable-side insulator **110** is defined by the abutting tiered surface **164** and rear end surface of the cable-side insulator **110**.

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The outer earbud contact **250** is made of a conductor with a cylindrical shape, and includes a connecting portion **251** connected to a conductive wire **25** in the earbud **20**, a fixed portion **252** fixed to the casings **22**, **23** of the earbud **20**, a mating recess **253** mated with the outer cable contact **150**, and a contact portion **254** making contact with the outer cable contact **150** during mating.

The connecting portion **251** is the rear end portion of the fixed portion **252**, and the mating recess **253** is the front inner peripheral portion of the fixed portion **252**. The mating recess **253** is mated to the outside of the outer cable contact **150**, and the inner peripheral surface forms the contact portion **254** which makes contact with the outer cable contact **150**. Threading grooves **255** are formed on the contact portion **254** enabling the outer cable contact **150** to be screwed in.

The earbud-side insulator **210** is made of an insulator with a cylindrical shape, and is forcibly inserted from the rear opening of the outer earbud contact **250**. A protruding portion **256** is formed in the inner peripheral portion of the outer earbud contact **250** to partition the insertion space of the earbud-side insulator **210** from the mating recess **253**. The insertion position of the earbud-side insulator **210** relative to the outer earbud contact **250** is defined by the front end of the earbud-side insulator **210** abutting the protruding portion **256**.

The inner earbud contact **260** is a pin-shaped conductor with a divided tip, and includes a connecting portion **261** connected to a conductive wire **26** in the earbud **20**, a fixed portion **262** fixed to the earbud-side insulator **210**, and a contact portion **263** making contact with the inner cable contact **160**. The connecting portion **261** is formed in the rear end portion of the fixed portion **262**, and the contact portion **263** is formed so as to protrude from the front end portion of the fixed portion **262**.

The inner earbud contact **260** is forcibly inserted from the rear opening of the earbud-side insulator **210**. A tiered surface **264** is formed in the rear end portion of the inner earbud contact **260**, and the insertion position of the inner earbud contact **260** relative to the earbud-side insulator **210** is defined by the tiered surface **264** abutting the rear end surface of the earbud-side insulator **210**.

The following is an explanation, with reference to FIGS. **5**, **6** and **9**, of the connection process performed using a connector **1** with the configuration described above. The connector **1** can be disconnected by performing the connection process in reverse.

The disconnected connector **1** shown in FIGS. **6** and **9** becomes the connected connector shown in FIG. **5** by taking the earbud **20** in one hand, and the cable connector **100** on the cable **30** in the other hand. Next, the outer cable contact **150** in the cable connector **100** is aligned with the outer earbud contact **250** in the earbud connector **200**, and the mating protrusion **153** of the outer cable contact **150** is mated with the mating recess **253** of the outer earbud contact **250**.

The mated outer contacts **150**, **250** are then screwed in. More specifically, the cable connector **100** or the earbud connector **200** is rotated relative to the other, to screw the threading grooves **155** formed in the mating protrusion **153** of the outer cable contact **150** with the threading grooves **255** formed in the mating recess **253** of the outer earbud contact **250**. The cable connector **100** and the earbud connector **200** are connected by screwing the outer contacts **150**, **250** into each other. This keeps the connectors from being pulled apart in the longitudinal direction of the cable. The earbud **10** does not become disconnected even when the cable **30** is tugged during use.



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When the outer contacts **150**, **250** are screwed in and mated, the loose threading-preventing member **120** provided on the cable connector **100** is compressed between the outer contacts **150**, **250**. The compressed loose threading-preventing member **120** makes elastic contact with both mated outer contacts **150**, **250**, and generates frictional force between the outer contacts **150**, **250**. This keeps the mated threading from becoming loose.

The inner contacts **160**, **260** become connected as the outer contacts **150**, **250** are screwed in and mated. More specifically, the contact portion **163** of the inner cable contact **160** is divided by the pin-shaped contact portion **263** with the divided base in the inner earbud contact **260**, the inner contacts **160**, **260** make elastic contact with each other, and an electrical connection is established.

The following is an explanation, with reference to FIG. **11** et seq., of the receiver in the second embodiment of the Present Disclosure and the connector **1B** used by the receiver. Components identical to those in the previous embodiment are denoted by the same reference numbers, and further explanation of these components has been omitted.

As shown in FIG. **11**, the connector **1B** in the second embodiment of the Present Disclosure differs from the connector in the previous embodiment in that the outer earbud contact **250B** includes an integrally formed rotation-preventing engagement portion **257** which engages the interior of the earbud **20** and prevents rotation of the outer earbud contact **250B**. The rotation-preventing engagement portion **257** shown in FIG. **11** has a square flange portion **257a** formed in the rear end portion (connecting portion **251**) of the outer earbud contact **250B**, and an engaging protrusion **257b** protruding at each of the four corners of the flange portion **257a**. When the engaging protrusions **257b** are engaged inside the earbud **20**, the outer earbud contacts **250B** are kept from rotating.

When the outer contacts **150**, **250B** are screwed into each other and mated, the outer earbud contact **250B** in the earphone connector **1B** is subjected to rotational force, but the simple rotation-preventing structure reliably prevents rotation of the outer earbud contact **250B**. The following is a more detailed explanation of the rotation-preventing structure of the outer earbud contact **250B**.

The earbud **40** in the second embodiment, as shown in FIGS. **12-4**, includes a driver unit **41** for converting electrical signals to sound, a front casing **42**, middle casing **43** and rear casing **44** constituting the casing, an ear pad **45** inserted into the user's ear, and a pair of connector holding members **46**, **47** for holding the earbud connector **200B**. The driver unit **41** is housed inside the middle casing **43**. The front end of the middle casing **43** is covered by the front casing **42**, and the rear end of the middle casing **43** is covered by the rear casing **44**. The earbud connector **200B** is incorporated into the earbud **40** while held by the pair of connector holding members **46**, **47**, and interposed between the middle casing **43** and the rear casing **44**.

The pair of connector holding members **46**, **47** are left-right symmetric and, as shown in FIG. **14**, interpose the earbud connector **200B** from the left and right, engage the flange portion **257a** of the outer earbud contact **250B**, and hold the earbud connector **200B** to keep it from being pulled out. Also, as shown in FIG. **13**, the pair of connector holding members **46**, **47** include engaging portions **46a**, **47a** for engaging the engaging protrusions **257b** on the outer earbud contact **250B**. The engaging portions **46a**, **47a** are inserted from the side between the engaging protrusions **257b** formed at the four corners of the flange portion **257a**, and hold the earbud connector **200B** so as to keep it from rotating. The pair of con-

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ductor holding members **46**, **47** holding the earbud connector **200B** so as to keep it from rotating are incorporated into the earbud **40** between the middle casing **43** and the rear casing **44**. In the second embodiment, as shown in FIG. **13**, the earbud end portion **260a** of the inner earbud contact **260** in the earbud connector **200B** protrudes in the shape of a square, and is interposed between the end surfaces **46b**, **47b** of the engaging portions **46a**, **47a**. Because the earbud end portion **260a** is interposed between the end surfaces **46b**, **47b**, the inner earbud contact **260** can be kept from rotating when the cable connector **100** is screwed into the earbud connector **200B**. Because of this simple rotation-preventing configuration, the outer earbud contact **250B** and the inner earbud contact **260** can be easily kept from rotating relative to the earbud **40** and the connector **1** can be reliably joined simply by assembling the components. Also, in the second embodiment, an inclined portion **33a** and a threaded portion **33b** are formed in the cover **33**, and a threaded portion **151b** is formed in the outer peripheral surface of the connecting portion **151** of the outer cable contact **150**. When the cover **33** is screwed in and attached to the cable connector **100**, the inclined portion **33b** presses the connecting protrusion **151a** of the connecting portion **151** shown in FIG. **10** against the copper foil **34** to complete the correcting chuck connection.

While a preferred embodiment of the Present Disclosure is shown and described, it is envisioned that those skilled in the art may devise various modifications without departing from the spirit and scope of the foregoing Description and the appended Claims.

What is claimed is:

1. A receiver having a connector connected electrically to a receiver main body and to a cable, the connector comprising:
  - an outer main body contact composed of a tube-shaped conductor and provided on the main body side;
  - an inner main body contact arranged inside the outer main body contact via an insulator;
  - an outer cable contact composed of a tube-shaped conductor and provided on the cable side, and
  - an inner cable contact arranged inside the outer cable contact via an insulator;
 wherein the connector is mounted on the receiver main body so that, in response to the outer main body contact and outer cable contact being mated, a coaxial connector is formed electrically connecting the outer contacts and the inner contacts, the outer contacts being screwed into each other, and the outer main body contact not rotating relative to the receiver main body.
2. The receiver of claim 1, wherein the outer main body contact includes an outer contact rotation-preventing engagement portion for engaging the receiver main body and preventing rotation of the outer main body contact.
3. The receiver of claim 2, wherein the inner main body contact includes an inner contact rotation-preventing engagement portion for engaging the receiver main body and preventing rotation of the inner main body contact.
4. The receiver of claim 3, wherein the receiver main body includes a main body engaging portion for engaging the outer contact rotation-preventing engagement portion and the inner outer contact rotation-preventing engagement portion.
5. The receiver of claim 4, wherein the outer main body contact or the outer cable contact includes a washer-shaped loose threading preventing member applying pressure to both outer contacts in response to the outer contacts being screwed in.
6. The receiver of claim 1, wherein the outer main body contact or the outer cable contact includes a washer-shaped

loose threading preventing member applying pressure to both outer contacts in response to the outer contacts being screwed in.

7. The receiver of claim 2, wherein the outer main body contact or the outer cable contact includes a washer-shaped loose threading preventing member applying pressure to both outer contacts in response to the outer contacts being screwed in. 5

8. The receiver of claim 3, wherein the outer main body contact or the outer cable contact includes a washer-shaped loose threading preventing member applying pressure to both outer contacts in response to the outer contacts being screwed in. 10

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